

Curr Treat Options Allergy
DOI 10.1007/s40521-015-0051-3

Asthma (M Jutel, Section Editor)

Psychological Interventions in Asthma

*Helen E. Smith, BM BSS, MSc, DM, MRCP, FFPHM**
Christina J. Jones, BA, MSc, PhD, CPsychol

Address

*Division of Primary Care and Public Health, Brighton and Sussex Medical School,
319 Mayfield House, Brighton, BN1 9PH, UK
Email: h.e.smith@bsms.ac.uk

© Springer International Publishing AG 2015

This article is part of the Topical Collection on *Asthma*

Keywords Asthma · Psychological intervention · Cognitive behavioural therapy · Cognitive therapy · Behavioural therapy · Counselling · Relaxation therapy · Meditation · Progressive relaxation · Autogenic training · Hypnosis · Psychoeducational · Written emotional disclosure

Opinion statement

Asthma is a multifactorial chronic respiratory disease characterised by recurrent episodes of airway obstruction. The current management of asthma focuses principally on pharmacological treatments, which have a strong evidence base underlying their use. However, in clinical practice, poor symptom control remains a common problem for patients with asthma. Living with asthma has been linked with psychological co-morbidity including anxiety, depression, panic attacks and behavioural factors such as poor adherence and suboptimal self-management. Psychological disorders have a higher-than-expected prevalence in patients with difficult-to-control asthma. As psychological considerations play an important role in the management of people with asthma, it is not surprising that many psychological therapies have been applied in the management of asthma. There are case reports which support their use as an adjunct to pharmacological therapy in selected individuals, and in some clinical trials, benefit is demonstrated, but the evidence is not consistent. When findings are quantitatively synthesised in meta-analyses, no firm conclusions are able to be drawn and no guidelines recommend psychological interventions. These inconsistencies in findings may in part be due to poor study design, the combining of results of studies using different interventions and the diversity of ways patient benefit is assessed. Despite this weak evidence base, the rationale for psychological therapies is plausible, and this therapeutic modality is appealing to both patients and their clinicians as an adjunct to conventional pharmacological treatments. What are urgently required are rigorous evaluations of psychological therapies in asthma, on a par to the quality of pharmaceutical trials. From this evidence base, we can then determine which interventions are beneficial for our patients with asthma management and more specifically which psychological therapy is best suited for each patient.

Key points

- Asthma is a condition in which psychological factors play a major role and psychological co-morbidities can co-exist. The rationale for including psychological therapies to improve health outcomes for patients with asthma seems logical.
- Because of poor methodological quality and small sample sizes, it is impossible to draw conclusions as to the effectiveness of psychological therapies in the management of adults or children with asthma.
- There are some promising results for specific therapies on isolated outcomes, for example, in adults CBT on quality of life, biofeedback on peak flow and relaxation therapies on medication use.
- The trials evaluating this clinical area are small, with heterogeneous interventions, poor quality study design and diversity of outcome measures that preclude the provision of guidance for clinical practice.
- This potentially important area of patient care needs the development of a rigorous research program where future work is influenced and improves upon existing studies.

Introduction

Asthma is a multifactorial chronic respiratory disease, characterised by recurrent airway inflammation and respiratory symptoms which include wheeze, shortness of breath, chest tightness and cough [1]. Asthma prevalence is variable between countries but can affect up to 18 % of the population [1]. The mainstay of current asthma treatment is pharmacological, and the armamentarium of pharmaceutical interventions has been shown in trials to achieve high levels of asthma control. However, in clinical practice, poor control remains a residual problem, impacting on quality of life and resulting in absenteeism from school and work.

Since the beginning of the twentieth century, it has been recognised that asthma is a condition in which psychological factors play a major role [2, 3]. Living with asthma has been linked with

psychological co-morbidity including anxiety, depression and panic attacks. Psychological co-morbidities have a higher-than-expected prevalence in patients whose asthma is difficult to control. This association may be due to the fact that people with asthma and people with psychological disorders, such as depression and anxiety, have similar patterns of dysregulation of key biological systems, including the neuro-endocrine stress response, cytokines and neuropeptides [4]. Twin-pair studies provide evidence also of a genetic link between atopic and depressive symptoms [5].

This review identifies and critiques the psychological therapies that have been used in the management of asthma to achieve modification to the patho-physiological processes of disease causation and improve lung function and wellbeing of patients.

Psychological therapies used in the management of asthma

Many different psychological therapies, individually and in combination, have been used in the management of patients with asthma. The diverse approaches range from behavioural and cognitive therapies to relaxation techniques and therapeutic writing. The most commonly used

psychological therapies in western medicine, and their key characteristics, are briefly described below:

Behavioural therapy

Behavioural therapies are concerned with identifying the processes by which behaviour has been learned (this could be by observation, association or reward). Behaviour modification is then achieved through a variety of interventions including reward/punishment and bio-feedback. In this form of therapy, it is the patient's behaviour, rather than their underlying motivations or cognitions that are the focus of interventions.

Cognitive therapy

Cognitive therapy involves identifying unhelpful thoughts that the patient may have, e.g. inappropriate fear of an asthma attack that can then trigger episodes of wheeze. The therapy enables constructive management of these damaging thoughts. Information is also used to modify cognitions, for example, an explanation of the relationship between anxiety and bronchoconstriction. In the literature, the term cognitive therapy is sometimes used synonymously with cognitive behavioural therapy (CBT).

Cognitive behavioural therapy

CBT, as its name implies, incorporates core elements of both behavioural and cognitive models of therapy. CBT places emphasis on the patient resolving their problems by developing and practising coping strategies.

Relaxation techniques

Recognising that anxiety and stress play a role in the onset and in the exacerbation of asthma symptoms relaxation methods have been tried to reduce panic and fear and to consciously produce the body's relaxed state characterised by slower breathing, lower blood pressure and a sense of calmness. Relaxation therapies include meditation, progressive relaxation (creating tension and relaxation systematically in different body parts), autogenic training (attending to bodily feelings and mentally controlling these) and hypnosis (deep relaxation induced by mental imagery). The use of relaxation therapies in the general asthmatic populations was the focus of a systematic review by Huntley in 2002.

Therapeutic writing

Therapeutic writing has been linked to improvements in physical and mental health in many scenarios [6]. Therapeutic writing takes two major forms, facilitated (where a facilitator is present during the writing process) or unfacilitated (writing is completed without assistance or feedback). It is a form of the latter, called written emotional disclosure, which has been studied most widely in asthma.

Counselling

Counselling is a psychological practice which enables conversation and the talking-over of problems one with another. Rather than the structured approach used in other therapies such as CBT, counselling involves more fluid

exploration of the patient's immediate concerns, and these concerns may change from session to session.

Bio-feedback

Bio-feedback is commonly used to treat anxiety and stress. It involves the patient learning to monitor biological indicators and to control these using relaxation techniques. Biofeedback is classified as a behavioural intervention when feedback to patients acts as reinforcement for positive or negative behaviours.

Psycho-educational interventions

Psycho-educational interventions are complex interventions involving education, training in self-management and targeting psychosocial issues [7]. Psycho-educational interventions are often provided by the regular health care provider (doctor, nurse or pharmacist) and frequently involve some written as well as verbal information.

The majority of the psychological therapies described above are practitioner-led, but, between therapeutic sessions, the patient may be required to practise the technique. Unlike pharmacological interventions, the individual therapies are not standardised in terms of their content, the duration of therapeutic sessions or the number of sessions offered. Some therapies can be delivered to groups of patients, and it is possible that the social interaction within a supportive non-judgemental peer group may facilitate the therapeutic effect by boosting self-esteem. In clinical practice, the person acting as 'therapist' might be the patient's regular doctor or a member of the wider multidisciplinary team (nurse or health psychologist), but, in trials of psychological interventions, the 'therapist' is often a member of the research team. Basic training in psychological therapies is available from short courses, or individuals can become accredited after postgraduate studies approved by organisations such as the British Association for Behavioural and Cognitive Psychotherapies, the American Counselling Association, the National Board for Certified Counsellors or the Canadian Counselling and Psychotherapy Association.

Evidence of efficacy of psychological interventions

Since 2005, three systematic reviews of psychological interventions for patients with asthma have been conducted; one Cochrane review addressed psychological interventions for children [8], another those for adults [9] with asthma severity ranging from mild to severe, and the third systematic review addressed psycho-educational interventions for both adults and children focusing only on those with severe asthma [7].

Psychological interventions for children with asthma

Twelve randomised controlled trials of psychological intervention for children and adolescents under the age of 18 years were identified in literature searched up to April 2007. The trials used four broad psychological approaches; six studies included an element of relaxation in their intervention [10–16], two

included cognitive behavioural therapy [17, 18], and three used biofeedback-assisted relaxation and one behavioural therapy [14, 19–21]. Different placebos or controls were used, and rarely was the therapy delivered in its pure form, but, instead, therapists often combined therapies or tailored them to the individual's needs. There were 588 children involved in the 12 trials; sample size varied from 18 to 112. The quality was poor, for example, no study reported a power calculation to determine sample size. Few studies identified the severity of the child's asthma or independently confirmed their asthma diagnosis. The outcomes measured were diverse, ranging from health service utilisation, lung function, symptoms of asthma, medication use, school absenteeism, psychological traits (e.g. coping, anxiety, depression, self-efficacy), quality of life and asthma-related knowledge.

When studies are small and findings inconsistent, it can be helpful to combine the observations into meta-analyses. Unfortunately, with a total of 22 different outcome measures and the diversity of psychological therapies trialled, only data from two studies of relaxation therapy could be pooled for analysis [10, 16]. The meta-analysis demonstrated a positive effect of relaxation therapy on lung function (PEFR) in the intervention group (32 L/min, 95 % CI 13 to 50 L/min). The authors correctly concluded that, from their systematic review, it is not possible to draw firm conclusions as to the benefit of psychological interventions in children with asthma [8].

Psychological interventions for adults with asthma

The equivalent systematic review for adults identified 15 randomised controlled trials of psychological interventions in adults with asthma in a search of the literature up until May 2007 [9]. The range of interventions studied was diverse; nine trials included one of six types of relaxation therapy [22–31]; four studies used behavioural therapy [30, 32–34] (three explicitly used biofeedback [30, 32, 33]; three incorporated cognitive behavioural therapy [28, 35, 36], one written emotional disclosure [28] and one included psychoeducational techniques [34]. The trials were generally small (range 12 to 106 patient), totalling 687 patients between them. The severity of the asthma ranged from mild to severe, but unfortunately not all studies defined their inclusion criteria, a fundamental piece of information. In the individual trials, the following positive outcomes were reported:

- Biofeedback reduced the use of controller medication (MD -2.43 95 % CI -4.15 to -0.71) and improved PEF (SMD 0.67 95 % CI 0.02 to 1.31) [32]
- CBT improved asthma quality of life (MD 1.00 95 % CI 0.46 to 1.54) and symptoms of obstruction (MD -0.80 95 % CI -1.49 to -0.11) and symptoms of anxiety (MD 1.00 95 % CI -1.84 to -0.16) [34]
- Relaxation reduced PRN medication (MD 0.03 95 % CI 0.00 to 0.77) and improved self-efficacy (MD 11.80 95 % CI 6.64 to 16.96) [31]

Given the wide variety of outcome measures used across these 15 trials, the possibility of meta-analyses was limited. However, three potentially promising results did emerge regarding biofeedback improving lung function (PEFR) [30, 32], cognitive behaviour therapy improving quality of life [34, 35] and relaxation therapy improving medication use [23,

31]. No therapy impacted on health service utilization or any other measure of frequency, duration or severity of asthma symptoms. As with the paediatric systematic review, the author's concluded that, due to the very poor methodological quality and small sample size of the trials, it was not possible to draw firm conclusions or to provide evidence to clinical practice of the effectiveness of psychological interventions for adults with asthma [9].

Psychoeducational interventions in severe asthma

In 2007, a systematic review was published focussing only on psycho-educational interventions and their contribution to the health and self-management outcomes in adults with severe or difficult asthma [7]. Seventeen studies were included which were divided into four categories: four self-management [37–40], three as educational [41–43], three as psychosocial [34, 35, 44] and seven as multi-faceted involving a combination of approaches [45–51]. Characteristics and content of interventions varied even within broad therapy types, and unfortunately, methodological quality was generally poor. The positive findings from individual trials are summarised below:

- Three of the trials using a multi-faceted psychoeducational interventions reported significant improvements in hospital admissions, all $ps < 0.05$ [45–47, 49].
- Educational interventions reported significant improvements in knowledge scores [41], A&E attendances [42], quality of life [42], symptoms, unscheduled health care attendances (RR 0.78, 0.53 to 1.14), preventive medication use, severity, self-management behaviour and social support, all $ps < 0.05$ [43].
- Psychosocial interventions reported significant improvements in severity [44], symptoms and respiratory function [34], panic attacks and anxiety symptoms and peak flow [35].

Psycho-educational interventions *may* improve self-management, reduce hospital admissions in adults and children and improve symptoms in children, but these positive effects observed from qualitative and quantitative syntheses were all short-term. Furthermore, benefit was confined to patients with a single risk factor associated with adverse outcomes, and the authors concluded that they were unable to identify any evidence of significant changes in the care of patients challenged by multiple clinical and psychosocial factors.

Recent evidence of psychological interventions in the management of asthma

Since 2011, six further publications have been identified in this field, two of which were systematic reviews and the remainder consisted of individual studies designed to test the effects of CBT, written emotional disclosure and psychoeducational on asthma outcomes.

Cognitive behavioural therapy (CBT)

CBT combined with education was used in one recent British randomised controlled trial to reduce asthma-specific fear in adults with asthma [52•]. The participants were a well-defined group of patients. To be eligible for the trial, patients had to have clinical anxiety (Hospital Anxiety Score of 8 more) and fear of asthma with a score of >28 on the Asthma Symptom checklist panic fear sub scale. The intervention was a booklet about asthma and one-to-one therapy sessions. There was an introductory session of 90 min, followed by four, five or six 1-h sessions at weekly or fortnightly intervals, and two further optional sessions. The intervention had no impact on the general levels of anxiety, but the end of treatment reduction in panic-fear was maintained at 6 months follow-up. The significant improvements in asthma-specific quality of life and depression observed immediately following CBT were not maintained at 6 months. The intervention had no impact on service use, and as the intervention cost between £378 and 798 per participant, the treatment had no cost advantage. This study appears to support the short- and longer-term efficacy of a CBT-based intervention in reducing panic fear in asthma, but, in the author's own words, the 'clinical significance of the effect was modest'. Once again, caution is required interpreting these results as there were methodological weaknesses in the study including clinical assessment post-randomisation with subsequent diversion of some patients to alternative treatments.

Also in 2012, there was published the results of a pilot prospective cohort study of a nurse who delivered CBT on anxiety and quality of life for children aged between 7 and 16 years [53•]. The intervention was six sessions every fortnight conducted by a respiratory nurse specialist who had received basic training in behaviour therapy techniques. The programme was described as CBT, but the descriptor is that of a multi-model intervention with mindfulness, breathing exercises and relaxation mentioned alongside CBT and behaviour therapy in the text. Ten out of 17 children completed the course, and their participation was associated with increased asthma quality of life and decreased anxiety and hyperventilation [53•]. This study was observational in design, and it confirms the feasibility of a nurse-led approach, but its quality as a body of evidence of effectiveness of the intervention would be classified as low in the GRADE approach to classification of evidence [54]. Confirmation of effectiveness will require a randomised controlled trial.

Non-pharmacological healthcare interventions for asthma management during pregnancy

Pharmacological therapy for asthma always aims to control symptoms and achieve the best lung function with the lowest effective dose of medication. During pregnancy, women's concerns regarding the safety of pharmacological agents and health professional's lack of certainty can lead to a combination of under-dosing and poor adherence. This threat to good asthma control heightens the need for effective non-pharmacological interventions that can be used pregnancy. Whilst reviews have been published on asthma management in

pregnant women and on psychological interventions in the general asthmatic population, none had specifically focused on pregnant women. A 2014 systematic review [55•] found and analysed three studies, an education program [56], progressive muscle relaxation [57] and Fraction of exhaled Nitric Oxide (FeNO) guided management of asthma in pregnant women [58]. The PMT and the FeNO-guided interventions showed significant improvements in maternal asthma control (lung function and quality of life) and the baby's birth weight.

The study of most relevance to our discussion of psychological interventions is that of progressive muscle relaxation [57]. In this randomised controlled trial, PMR was compared with sham training; improvements were seen in measures of lung function (FEV1 and PEF) and in some measures of quality of life (five of eight domains on the SF-36 (role physical, vitality, social functioning, role emotional, mental health), and two of five scales on the State-Trait Anger Expression Inventory (State-Anger, Trait-Anger)). The weaknesses of this study include lack of allocation concealment, no information on reasons for withdrawal and no confirmation that participants followed the instructions. Follow up was conducted after 8 weeks; therefore, this study does not tell us whether a PMR intervention would have had similar effects in the longer-term, during asthma exacerbations or in women at different gestations.

Written emotional disclosure

A Cochrane systematic review published in 2014 focussed on the effects of written emotional disclosure on asthma [59•]. The review identified four randomised controlled trials. Three focussed on its effectiveness in adults and one in children and young people (aged 12 to 17 years). In all four trials, the interventions used were clearly defined and very similar, but the variety of outcome measures used and the variation in the frequency and timing of post-intervention assessments limited the range of calculation possible for meaningful pooled effects. It was possible to combine the results from studies to examine the impact of WED on lung function, symptoms and asthma control, and in all of this writing, therapy had no effect. The review concluded that there was insufficient evidence to support written emotional disclosure in the treatment of individuals with asthma. The data seem to suggest that positive results are observed when the intervention is offered to those with moderate rather than mild asthma, as evidenced by the Smyth study [60]. Sub-group analysis using hierarchical linear modelling conducted on the data generated by Smith trial found improvement only in those whose asthma was moderate (65–85 % FEV₁ % predicted at baseline) [61•]. It may be that asthmatics need to be sick enough to show benefit but not so sick that the biological disease processes overrides any psychological influences on their asthma. This interesting possibility will require studies with sufficient participants that they can be stratified by their asthma severity.

Psycho-educational interventions

In 2011, a research group in the US published their findings from a feasibility study of manualised stress management intervention for 7–12-year-olds [62•]. The intervention was an adaptation of a generic stress management intervention

(*'I can cope'*) that is based on the principles of CBT. The therapy is six in 50-min individual sessions, with didactic training followed by a 20-min relaxation exercise. The relaxation exercise was also to be practiced for 15 min each day. The therapy was delivered by graduate students who had received basic training in CBT, stress, asthma, emotions, problem solving and coping skills, and relaxation with physiological feedback. The first feasibility study was based in a university setting did not provide compelling support for feasibility, but representativeness and recruitment were boosted by adapting the intervention for a school setting. Participants showed improvement in psychosocial (stress and mood) and pulmonary function from pre- to post-intervention, but, without randomisation, it is impossible to exclude that the positive changes observed are as a result of regression to the mean rather than intervention-related improvement.

Current recommendations

Whilst psychological and psychosocial factors are recognised as a risk factor for asthma-related morbidity and mortality in international guidelines and the most recent BTS/SIGN and GINA guidelines recommend psychological interventions are offered to promote adherence, there are no recommendations of psychological therapies to improve health outcomes. The GINA guidelines do acknowledge that psychological interventions may be beneficial in those with severe asthma (Table 1).

What are the challenges for research?

The challenge for clinical research is as always to produce clinically meaningful data from robust, high-quality, randomised controlled trials. Whilst there is a steady increase in publications about psychological interventions for people with asthma, the improvements in research quality have been slow and hence have generated little expansion in evidence, to underpin the adoption or otherwise of non-pharmacological therapies for asthma. Even studies that are randomised provide weak evidence as they are characterised by small sample sizes, lack of adequate control group, formal randomisation and double blinding. Few studies report the mechanism for confirming asthma diagnosis and rarely describe participants' psychological profiles.

Asthma severity, if reported, is often mild or moderate. However, it is severe asthma, which affects less than 10 % of patients, that accounts for 50 % of the health service costs associated with asthma. Studies of psychological therapies need to focus on this group specifically or at least stratify participants by asthma severity so that analysis can be conducted within subgroups. Similarly, we need to discontinue the habit of screening for psychiatric morbidities and then exclude anyone with any mental health problem, as these may be just the individuals that can most benefit from a psychological intervention. Clinicians' observations seem to support this perspective; they often have anecdotes of positive benefit for individuals from psychological interventions. We propose that this discrepancy may in part arise because, in clinical practice, psychological treatments are often reserved for distressed patients with severe or poorly

Table 1. UK, European and American guidelines on psychological interventions for asthma

Organisation	Guideline name	Recommendation
British Thoracic Society (BTS)/Scottish Intercollegiate (SIGN)	British guideline on the management of asthma October 2014	"Initiatives to promote adherence to regular treatment should consider... behavioural support, e.g., regular monitoring including assessment of medication use with feedback, counselling, psychological therapies" Patients with severe asthma and one or more adverse psychosocial factors are at risk of death.
Global Initiative for Asthma (GINA)	Global strategy for asthma management and prevention August 2014	Major psychological problems identified as a potentially modifiable independent risk factor for exacerbations. Treatment strategy for those with major psychological problems "arrange mental health assessment, help patient distinguish between symptoms of anxiety and asthma; provide advice about management of panic attacks". "Information alone improves knowledge but does not improve asthma outcomes. Social and psychological support may also be required to maintain positive behavioural change, and skills are required for effective medication delivery". "Cognitive behavioural therapy has been described as having some potential in patients with asthma; however, current evidence is limited with a small number of studies and methodological shortcomings". "Psychological interventions may be helpful in patients with severe asthma"
European Respiratory Society (ERS)/American Thoracic Society (ATS) Task Force	International ERS/ATS guidelines on definition, evaluation and treatment of severe asthma April 2014	"Unfortunately, the benefit of psychiatric treatment on asthma outcomes has not been well established and a recent Cochrane meta-analysis evaluating psychological interventions involving various relaxation and behavioural techniques both in adults and children was not able to find firm benefit of these interventions on asthma outcomes."
Canadian Thoracic Society	Canadian Thoracic Society 2012 guideline update: Diagnosis and management of asthma in pre-schoolers, children and adults	N/A
National Heart Lung and Blood Institute	Guidelines for the Diagnosis and Management of Asthma November 2007	Psychosocial problems or psychiatric disease identified as a risk factor for asthma-related death

controlled asthma whereas study populations (with their well-controlled mild asthma and no psychological morbidity) are less able to benefit.

When trials are inadequately powered, the findings can sometimes be pooled to achieve clinically meaningful results. However, meta-analysis cannot overcome the shortcomings of poor-quality trials. Similarly, meta-analysis cannot cope with the variety of outcome measure used, even when studies are using a therapy from the same category. To facilitate pooling of results, studies need to be standardised with respect to outcome measures and the frequency and duration of post-intervention assessments. The majority of studies conduct very short follow-up, between 1 and 3 months post-intervention. Resources often limit follow-up, but wherever possible, a 12-month post-intervention assessment is desirable as it suggests sustainability and eliminates the possibility of bias arising from symptom changes with seasonality.

What are the challenges for clinical practice?

The challenge for clinical practice is that the 'jury is still out' with respect to psychological interventions for patients with asthma. Whilst the rationale for their utility may seem strong (they are attractive to both clinicians and patients who wish to moderate or augment pharmacological therapy and there is anecdotal evidence of success in the management of individuals), the evidence of their effectiveness from studies is weak and inconsistent. The recent attempts to pool data to strengthen our evidence base for the benefit of psychological interventions do not generate significant or firm conclusions. Hence, clinical guidelines make appropriately no or very speculative recommendations about the adoption of psychological interventions in clinical practice.

There is an inadequate evidence base for the introduction of psychological therapies for adults and children with asthma. For those clinicians already using them in their clinical work, it is important to acknowledge the uncertainty of their evidence base and to ensure that in their use they do no harm (*primum non nocere*). Psychological therapies are resource- and person-intensive, so the costs of therapy (both direct and opportunity) must be estimated and attempts made to ensure benefit is commensurate. In the future, psychological interventions that are more patient-led rather than professional-led could help reduce the financial burden on individuals and health services.

Clinicians interested in psychological therapies need to contribute to strengthening the evidence base either by recruiting their patients to ongoing trials of therapies or collaborating with their health service research and psychology colleagues to develop trials which are rigorously designed, well conducted and carefully reported.

Conclusions

Both clinicians and patients recognise that emotional stress precipitates and exacerbates asthma. However, patient's psychological status may itself affect their asthma control by impacting on adherence or self-care (e.g. use of

medication, allergen avoidance).

Based on the current literature, no endorsement of psychological interventions in the care of patients with asthma can be made. Although some findings do indicate that psychological interventions can lead to improvements in various aspects of well-being, these findings are inconsistent and require confirmation in studies of better quality.

Compliance with ethics guidelines

Conflict of interest

Helen E Smith declares no conflicts of interest.

Christina J Jones declares no conflicts of interest.

Human and animal rights and informed consent

This article does not contain any studies with human or animal subjects performed by any of the authors.

References

Papers of particular interest, published recently, have been highlighted as:

- Of importance

1. Global Initiative for Asthma. Global strategy for asthma management and prevention 2014. Available from: www.ginasthma.org
2. Lehrer PM, Isenberg S, Hochron SM. Asthma and emotion: a review. *J Asthma*. 1993;30(1):5–21.
3. Ritz T, Steptoe A, DeWilde S, Costa M. Emotions and stress increase respiratory resistance in asthma. *Psychosom Med*. 2000;62(3):401–12.
4. Van Lieshout RJ, MacQueen G. Psychological factors in asthma. *Allergy Asthma Immunol*. 2008;4(1):12.
5. Wamboldt MZ, Hewitt JK, Schmitz S, Wamboldt FS, Räsänen M, Koskenvuo M, et al. Familial association between allergic disorders and depression in adult Finnish twins. *Am J Med Genet*. 2000;96(2):146–53.
6. Pearson LE. The use of written communications in psychotherapy. 1965.
7. Smith JR, Mugford M, Holland R, Noble MJ, Harrison BD. Psycho-educational interventions for adults with severe or difficult asthma: a systematic review. *J Asthma*. 2007;44(3):219–41.
8. Yorke J, Fleming S, Shulldham C. Psychological interventions for children with asthma. *Cochrane Database Syst Rev*. 2005;4, CD003272.
9. Yorke J, Fleming SL, Shulldham C. Psychological interventions for adults with asthma. *Cochrane Database Syst Rev*. 2006;1, CD002982.
10. Alexander BA, Miklich DR, Hershkoff H. The immediate effects of systematic relaxation training on peak expiratory flow rates in asthmatic children. *Psychosom Med*. 1972;34(5):388–94.
11. Hock R, Rodgers C, Reddi C, Kennard D. Medico-psychological interventions in male asthmatic children: an evaluation of physiological change. *Psychosom Med*. 1978;40(3):210–5.
12. Hua-Bin Y, Yan-Qing T, Zhu-Wen Y. Effect of relaxation training on psychosomatic symptoms of children with asthma. *Chin J Clin Rehabil*. 2004;8(36):8392–3.
13. Kohen D. Relaxation and mental imagery (self-hypnosis) for childhood asthma: behavioural outcomes in a prospective, controlled study. *Aust J Clin Hypnother Hypn*. 1996;24:12–28.
14. Kotses H, Harver A, Segreto J, Glaus KD, Creer TL, Young GA. Long-term effects of biofeedback-induced facial relaxation on measures of asthma severity in children. *Biofeedback Self Regul*. 1991;16(1):1–21.
15. Perrin JM, Maclean JRWE, Gortmaker SL, Asher KN. Improving the psychological status of children with asthma: a randomized controlled trial. *J Dev Behav Pediatr*. 1992;13(4):241–7.
16. Weingarten MA, Goldberg J, Teperberg Y, Harrison N, Oded A. A pilot study of the multidisciplinary management of childhood asthma in a family practice. *J Asthma*. 1985;22(5):261–5.
17. Colland VT. Learning to cope with asthma: a behavioural self-management program for children. *Patient Educ Couns*. 1993;22(3):141–52.
18. Gabriela Pérez M, Feldman L, Caballero F. Effects of a self-management educational program for the control of childhood asthma. *Patient Educ Couns*. 1999;36(1):47–55.

19. Dahl J, Gustafsson D, Melin L. Effects of a behavioral treatment program on children with asthma. *J Asthma*. 1990;27(1):41-6.
20. Khan AU, Staerk M, Bonk C. Role of counter-conditioning in the treatment of asthma. *J Psychosom Res*. 1973;17(5):389-92.
21. Khan AU. Effectiveness of biofeedback and counter-conditioning in the treatment of bronchial asthma. *J Psychosom Res*. 1977;21(2):97-104.
22. Deter H-C, Allert G. Group therapy for asthma patients: a concept for the psychosomatic treatment of patients in a medical clinic—a controlled study. *Psychother Psychosom*. 1983;40(1-4):95-105.
23. Epstein G, Halper JP, Manhart Barrett E, Birdsall C, McGee M, Baron K, et al. A pilot study of mind-body changes in adults with asthma who practice mental imagery. *Altern Ther*. 2004;10(4):66-71.
24. Erskine J, Schonell M. Relaxation therapy in bronchial asthma. *J Psychosom Res*. 1979;23(2):131-9.
25. Ewer TC, Stewart DE. Improvement in bronchial hyper-responsiveness in patients with moderate asthma after treatment with a hypnotic technique: a randomised controlled trial. *Br Med J (Clin Res Ed)*. 1986;293(6555):1129.
26. Freeman LW, Welton D. Effects of imagery, critical thinking, and asthma education on symptoms and mood state in adult asthma patients: a pilot study. *J Altern Complement Med*. 2005;11(1):57-68.
27. Henry M, De Rivera JG, Gonzalez-Martin I, Abreu J. Improvement of respiratory function in chronic asthmatic patients with autogenic therapy. *J Psychosom Res*. 1993;37(3):265-70.
28. Hockemeyer J, Smyth J. Evaluating the feasibility and efficacy of a self-administered manual-based stress management intervention for individuals with asthma: results from a controlled study. *Behav Med*. 2002;27(4):161-72.
29. Lehrer PM, Hochron SM, Mayne T, Isenberg S, Carlson V, Lasoski AM, et al. Relaxation and music therapies for asthma among patients prestabilized on asthma medication. *J Behav Med*. 1994;17(1):1-24.
30. Lehrer P, Carr RE, Smetankine A, Vaschillo E, Peper E, Porges S, et al. Respiratory sinus arrhythmia versus neck/trapezius EMG and incentive spirometry biofeedback for asthma: a pilot study. *Appl Psychophysiol Biofeedback*. 1997;22(2):95-109.
31. Wagaman MJ. Physiological and psychological effects of various hypnotic suggestions with asthma patients. *Diss Abstr Int B Sci Eng*. 2000;61(1-B):185.
32. Lehrer PM, Vaschillo E, Vaschillo B, Lu S-E, Scardella A, Siddique M, et al. Biofeedback treatment for asthma. *Chest J*. 2004;126(2):352-61.
33. Payette BA. The effect of EMG biofeedback training on selected physiological and personality variables in the adult asthma patient. 1977.
34. Put C, Van den Bergh O, Lemaigre V, Demedts M, Verleden G. Evaluation of an individualised asthma programme directed at behavioural change. *Eur Respir J*. 2003;21(1):109-15.
35. Ross CJ, Davis TM, Macdonald GF. Cognitive-behavioral treatment combined with asthma education for adults with asthma and coexisting panic disorder. *Clin Nurs Res*. 2005;14(2):131-57.
36. Sommaruga M, Spanevello A, Migliori G, Neri M, Callegari S, Majani G. The effects of a cognitive behavioural intervention in asthmatic patients. *Monaldi archives for chest disease=Archivio Monaldi per le malattie del torace/Fondazione clinica del lavoro, IRCCS [and] Istituto di clinica fisiologica e malattie apparato respiratorio, Università di Napoli, Secondo ateneo*. 1995;50(5):398-402.
37. Blixen CE, Hammel JP, Murphy D, Ault V. Feasibility of a nurse-run asthma education program for urban African-Americans: a pilot study. *J Asthma*. 2001;38(1):23-32.
38. Morice A, Wrench C. The role of the asthma nurse in treatment compliance and self-management following hospital admission. *Respir Med*. 2001;95(11):851-6.
39. Osman L, Calder C, Godden D, Friend J, McKenzie L, Legge J, et al. A randomised trial of self-management planning for adult patients admitted to hospital with acute asthma. *Thorax*. 2002;57(10):869-74.
40. Yoon R, McKenzie D, Bauman A, Miles D. Controlled trial evaluation of an asthma education programme for adults. *Thorax*. 1993;48(11):1110-6.
41. Brewin A, Hughes J. Effect of patient education on asthma management. *Br J Nurs (Mark Allen Pub)*. 1994;4(2):81-2.
- 99-101.
42. Ford ME, Havstad SL, Tilley BC, Bolton MB. Health outcomes among African American and Caucasian adults following a randomized trial of an asthma education program. *Ethn Health*. 1997;2(4):329-39.
43. Garrett J, Fenwick JM, Taylor G, Mitchell E, Stewart J, Rea H. Prospective controlled evaluation of the effect of a community based asthma education centre in a multiracial working class neighbourhood. *Thorax*. 1994;49(10):976-83.
44. Groen J, Pelsers H. Experiences with, and results of, group psychotherapy in patients with bronchial asthma. *J Psychosom Res*. 1960;4(3):191-205.
45. Castro M, Zimmermann NA, Crocker S, Bradley J, Leven C, Schechtman KB. Asthma intervention program prevents readmissions in high healthcare users. *Am J Respir Crit Care Med*. 2003;168(9):1095-9.
46. George MR, O'Dowd LC, Martin I, Lindell KO, Whitney E, Jones M, et al. A comprehensive educational program improves clinical outcome measures in inner-city patients with asthma. *Arch Intern Med*. 1999;159(15):1710-6.
47. Kelso TM, Abou-Shala N, Heilker GM, Arheart KL, Portner TS, Self TH. Comprehensive long-term management program for asthma: effect on outcomes in adult African-Americans. *Am J Med Sci*. 1996;311(6):272-80.
48. Kelso TM, Self TH, Rumbak MJ, Stephens MA, Garrett W, Arheart KL. Educational and long-term therapeutic intervention in the ED: effect on outcomes in adult

- indigent minority asthmatics. *Am J Emerg Med*. 1995;13(6):632–7.
49. Mayo PH, Richman J, Harris HW. Results of a program to reduce admissions for adult asthma. *Ann Intern Med*. 1990;112(11):864–71.
 50. Nathell L. Effects on sick leave of an inpatient rehabilitation programme for asthmatics in a randomized trial. *Scand J Pub Health*. 2005;33(1):57–64.
 51. Smith JR, Mildenhall S, Noble MJ, Shepstone L, Koutantji M, Mugford M, et al. The coping with asthma study: a randomised controlled trial of a home based, nurse led psychoeducational intervention for adults at risk of adverse asthma outcomes. *Thorax*. 2005;60(12):1003–11.
 - 52.● Parry GD, Cooper CL, Moore JM, Yadegarfar G, Campbell MJ, Esmonde L, et al. Cognitive behavioural intervention for adults with anxiety complications of asthma: prospective randomised trial. *Respir Med*. 2012;106(6):802–10.
- RCT of CBT in well-defined population (asthmatics with clinical anxiety). Improved anxiety and depression in short term not maintained at 6 months. Reduction in fear was maintained.
- 53.● Marriage D, Henderson J. Cognitive behaviour therapy for anxiety in children with asthma. *Nurs Child Young People*. 2012;24(9):30–4.
- Observational study confirming the feasibility of a respiratory nurse specialist led CBT intervention for 7 to 16 year olds with asthma. Pre- and post-intervention improvements noted, but quality of evidence low as non-randomised.
54. Guyatt GH, Oxman AD, Vist GE, et al. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ*. 2008;336:924.
 - 55.● Zairina E, Stewart K, Abramson MJ, George J. The effectiveness of non-pharmacological healthcare interventions for asthma management during pregnancy: a systematic review. *BMC Pulm Med*. 2014;14:46.
- The first systematic review of psychological interventions for pregnant women with asthma. It identified three non-pharmacological interventions that may improve limited aspects of asthma control and neonatal outcomes. Progressive muscle relation was the intervention most closely aligned to psychological interventions.
56. Murphy VE, Gibson PG, Talbot PI, Kessell CG, Clifton VL. Asthma selfmanagement skills and the use of asthma education during pregnancy. *Eur Respir J*. 2005;26:435–41.
 57. Nickel C, Lahmann C, Muehlbacher M, et al. Pregnant women with bronchial asthma benefit from progressive muscle relaxation: a randomized, prospective, controlled trial. *Psychother Psychosom*. 2006;75:237–43.
 58. Powell H, Murphy VE, Taylor DR, et al. Management of asthma in pregnancy guided by measurement of fraction of exhaled nitric oxide: a double-blind, randomised controlled trial. *Lancet*. 2011;378:983–90.
 - 59.● Paudyal P, Hine P, Theadom A, Apfelbacher CJ, Jones CJ, Yorke J, et al. Written emotional disclosure for asthma. *Cochrane Database Syst Rev*. 2014;5, CD007676.
- A systematic review and meta-analysis identifying four studies which have used written emotional disclosure in both adults (n=3) and children (n=1) to improve asthma outcomes. The review concluded that there is currently insufficient evidence to support written emotional disclosure therapy in the treatment of individuals with asthma.
60. Smyth JM, Stone AA, Hurewitz A, Kaell A. Effects of writing about stressful experiences on symptom reduction in patients with asthma or rheumatoid arthritis: a randomized trial. *JAMA*. 1999;281(14):1304–9.
 - 61.● Smith H, Jones CJ, Hankins M, et al. The effects of expressive writing on lung function, quality of life, medication use and symptoms in adults with asthma: a randomised controlled trial. *Psychosomatic Medicine* (2015).
- Most recent publication of a double-blind randomised controlled trial of written emotional disclosure which reported that emotional writing appears to improve lung function in those with moderate, but not mild asthma.
- 62.● Long KA, Ewing LJ, Cohen S, Skoner D, Gentile D, Koehrsen J, et al. Preliminary evidence for the feasibility of a stress management intervention for 7- to 12-year-olds with asthma. *J Asthma*. 2011;48(2):162–70.
- Feasibility study of a manualised stress intervention for 7 to 12 year olds with asthma. Uptake was greater and attracted a more diverse patient population when was intervention provided in a familiar school setting rather than a university. Pre- and post-intervention improvements noted, but quality of evidence is low as this was a non-randomised study.